INDIA WEATHER REVIEW, 1961

ANNUAL SUMMARY

PART-C

STORMS & DEPRESSIONS

I. DEPRESSIONS AND CYCLONIC STORMS

During the year, 3 cyclonic storms and 9 depressions formed in the Bay of Bengal and 2 cyclonic storms and 1 depression in the Arabian Sea. Two of the depressions, which formed in the Bay of Bengal, moved across the country and emerged into the Arabian Sea. In addition to the above, there were three land depressions, two of which developed over Saurashtra and Kutch and one over the central parts of the country. The tracks of the storms and depressions are given separately in Plates 1 and 2. The dates of activity of the storms and the greatest barometric depths observed (or estimated) near their centres are summarised in the following table:

Locality	Month	Date	Greatest observed barometric depths (mb).
Bay of Bengal	May	5th to 9th	30 (estimated)
Arabian Sea	May	23rd to 25th	27 (estimated)
Bay of Bengal	May	25th to 30th	25 (estimated)
Arabian Sea	June	21st to 24th	20 (estimated)
Bay of Bengal	September	11th to 17th	18 (estimated)

The monthly distribution of the storms and depressions for the year 196 is given in the Table II at the end. The detailed description of the systems are given below.

1 Depression in the Bay of Bengal and the Arabian Sea—9th to 11th January—

A low pressure area, which moved westwards across south Andaman Sea on 5th, lay over southeast Bay of Bengal on 7th and was well marked. Bay Islands reported widespread rainfall on the 6th and 7th.

The well marked low pressure area remained practically stationary over southeast Bay on the 8th and then moved slowly westnorthwestwards into the southwest Bay of Bengal by the morning of the 9th with its central region near 9°N,84° as indicated by the following observations of 9th.

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PART C

STORMS AND DEPRESSIONS

CONTENTS

Name of the Ship/Stn.	Position	Hour of Obsn.(IST)	Wind Dirn.	Wind Speed Knots	Remarks
Trincomalee	-	0830	NNW	10	Continuous drizzle
Batticola		0830	NW	10	
S.S.Matheran	8.5°N,83.5°E		W	5	
S.S.Leicester-shire	10.6°N,88.0°E		E	20	Rain and Showers
Ocean Endurance	11.0°N,84.7°E	0530	E	20	

At 0830 IST on the 9th, stations in east coast of Ceylon recorded an increase in rainfall and a pressure fall of 1 mb (corrected for diurnal variation), during the previous 12 hours. Moving westwards, the well marked low pressure are intensified further and was lying off the northeast coast of Ceylon at 1730 IST o the 9th. At this time, pressures were falling more markedly over the east coast of Ceylon and the pressure deficiency over Trincomalee was of the order of 3 mb. The cyclonic circulation associated with the system extended upto about 7 km abov sea level. During the night of 9/10th, it concentrated into a depression and was centred at 0130 IST of 10th near 9°N, 81°E. The pressure departures of Trincomal and Nagapattinam at 0130 IST on the 10th was -5 to -6 mb. The estimated pressur deficiency at the centre of the depression was about 7 mb. The following observations of 10th are significant.

Station	Hour of Obsn.(IST)	Wind Dirn	Wind Speed (Knots)	Pressure (mb)	Remarks
Nagapattinam	0130	NNE	05	1007.8	Drizzle
Pamban	0130	WNW	08	1009.6	
Kankesanturai	0130	NE	08		Moderate continuous rain
Trincomalee	0130	SW	15	1005.7	
Batticola	0130	S	05	1009.4	

The depression moved west and at 0830 IST on 10th. It was centred near 9°N, 80.5°E. The following observations of 10th are relevant in this connection:

Name of the Ship/Stn.	Position	Hour of Obsn.(IST)	Wind Dirn	Wind Speed (Knots)	Remarks
Mannar		0830	NW	15	Drizzle
Trincomalee		0830	S	30	
S.S.Bharatrani	9.7°N,93.2°E	0530	SSE	15	

Trincomalee recorded 10 cm of rain at 0830 IST on the 10th. Upper wind over Trichinopoly backed to N/NNE and freshened to 25 knots between 0.6 and 0.9 k at 0530 IST on the 10th. Negative pressure departures over northeast Ceylon and

extreme southeast Madras State were of the order of 2 to 3 mb. The depression moved rapidly westsouthwestwards into the Gulf of Mannar and was centred near 8.5°N, 78.5°E at 1730 IST on the 10th. Moving further westsouthwestwards, it lay near 8°N, 78°E by the midnight of the 10th. Tuticorin reported surface eastnortheasterly winds of 25 knots and the cyclonic circulation associated with the depression was well marked upto 3 km above sea level. Under its influence, squally weather occurred in the Gulf of Mannar and the adjoining Comorin area. According to press reports, ten cargo boats were sunk near Tuticorin on the night of 10th due to strong winds.

Thereafter, the depression moved westwards, weakened and lay as a low pressure area over the Maldive-Laccadive area at 0830 IST on the 11th. Subsequently, it moved northwestwards and weakened into a low pressure area.

Under the influence of this depression, fairly widespread rain occurred in the Madras State on the 11th and scattered rain in Kerala on the 11th and 12th Cuddalore and Palayankottai reported exceptionally heavy falls of 13 cm each on the 11th. The other noteworthy amounts of rainfall were:

Date	Station	Rainfall (cm)
11th	Tuticorin	9
	Kodaikanal	7
	Kallakkurichchi	7
	Nagapattinam	5
	Kanyakumari	5

2 Deep depression in the Bay of Bengal—
—18th to 21at February—

A low pressure area from the east moved across the extreme south Andaman Sea on the evening of the 15th, intensifying the seasonal trough over the extreme south Bay and adjoining areas of the Indian Ocean. Ships near the equator and the adjoining areas of the southern hemisphere reported strong westerly winds and squally weather as evident from the following observations of the 16th.

Name of the Ship/Stn.	Position	Hour of Obsn. (IST)	Wind Dirn	Wind Speed (Knots)	Remarks
British Patience	3.5°S,83.5°E	1730	W	30	Rainshowers
Strathaird	Equator,86.5°E	1730	W	25	Moderate intermittent rain
Pol.Rambler	4.5°S,84.5°E	1730	W	40	Heavy squall
Sueric	1.0°N,87.4°E	1730	NW	15	Rainshower in previous hour

A well marked low pressure area developed over the south Bay by 0830 IST on the 18th. The associated upper level trough extended to 4.5 km above sea level.

By the evening of the 18th, the well marked low pressure area concentrated into a depression which was centred at 1730 IST near 6.5°N, 87.0°E. The following observations of the 18th were significant:

Name of the Ship/Stn.	Position	Hour of Obsn. (IST)	Wind Dirn.	Wind Speed (Knots)	Remarks
S.S.Salween	7.0°N,84.1°E	1730	N	25	Moderate continuou rain
S.S.Kaulalampur	6.0°N,88.9°E	1730	S	10	Precipitation in sight
S.S.Mary Welloyed	6.0°N,86.1°E	1730	NNW	10	Slight continuous/
S.S.Saihomaru	5.5°N,85.6°E	1730	NW	25	Slight intermitten rain

During the next 12 hours, the depression remained practically stationar in southwest Bay centred near 7.0°N, 86.5°E. The depression moved northwards and intensified into a deep depression by 1730 IST on 19th, when it lay centred near 8.5°N, 86.5°E as indicated by the following ibservations:

Name of the Ship/Stn.	Position	Hour of Obsn. (IST)	Wind Dirn.	Wind Speed (Knots)	Remarks
S.S.Ormara	10.0°N,83.5°E	1730	N	25	Squall
S.S.Ormara	10.1°N,83.0°E	2330	N	25	Rain
S.S.Kaulalampur	6.0°N,87.6°E	1730	W	20	Precipitation in sight
S.S.Saihomaru	5.7°N,90.2°E	1730	SW	20	Shower in previous hou
S.S.Nomerkurk	5.8°N,88.4°E	1730	NW	20	-do-
S.S.Salween	9.4°N,88.6°E	1730	SE	10	-do-

Continuing its northerly course, the deep depression was centred near 9.5°N, 86.5°E at 0830 IST on 20th. During the next 12 hours, the deep depression remained practically stationary with centre near 9.5°N, 86.5°E as shown by the following observations of the 20th.

Name of the Ship/Stn.	Position	Hour of Obsn. (IST)	Wind Dirn.	Wind Speed (Knots)	Remarks
OceanEndurance	12.6°N,85.3°E	1730	ENE	10	
State of Madras	11.7°N,84.5°E	1730	NNE	25	
Jalapadma	9.8°N,83.2°E	1730	NW	20	Squall
Bharat Bhushan	8.5°N,82.7°E	1730	N	20	Slight intermittent drizzle
Salween	5.5°N,84.2°E	1730	NW	15	
Kondul		1730	SE	02	Drizzle in previous hour

The estimated pressure deficiency at the centre of the deep depression then was about 8 mb. Thereafter, remaining practically stationary, it weakened into a depression by 0830 IST on21st. By 1730 IST of 21st, the depression weaken into a low pressure area over south Bay.

In association with this system, fairly widespread rain occurred over t Bay Islands and Ceylon on 2 days. The noteworthy amounts of rainfall were:

Date	Station	Rainfall (cm)
18th	Batticola	9
	Port Blair	5
19th	Port Blair	5
22nd	Port Blair	6

3 Severe cyclonic storm in the Bay of Bengal—
—5th to 9th May—

A well marked cyclonic circulation, extending upto 2 km above sea level developed over the north Andaman Sea on the evening of 3rd May. Port Blair recorded 8 cm and Car Nicobar 5 cm of rain, although surface pressures were not falling and pressure departures were above normal. During the next 12 hours, the pressure fell by about 1 mb over the north Bay Islands and the adjoining Andaman Sea. The upper level cyclonic circulation over that area extended to 4.5 km above sea level. The associated trough aloft in the easterlies extended upto 9 km above sea level. By the evening of the 4th, there was a further fall of surface pressure by 1.5 mb over the same region, and a low pressure area appeared at sea level over north Bay Islands and the adjoining parts of Andaman Sea. The low pressure area concentrated into a depression by 0830 IST on the 5th with centre near 11.5°N, 95.5°E. The following observations of 5th are relevant in this connection:

Name of the Ship/Stn.	Position	Hour of Obsn. (IST)	Wind		Remarks
			Dirn.	Speed (Knots)	
Coco Island		0830	NE	05	Moderate continuous drizzle
Maya Bandar		0830	ESE	10	Heavy intermittent rain
Port Blair		0830	NNW	05	Slight continuous rain
Car Nicobar		0830	NW	05	Moderate continuous rain
ISEMARU	10.2°N,95.3°E	0530	Calm	-	-
Mergui		0830	SE	05	-

The estimated pressure defect at the centre of the depression was about 7 mb. Moving in a northwesterly direction, it became a deep depression by 1730 IST of 5th and was centred near 12.0°N, 95.0°E. Upper winds over Port Blair strengthened to 350°/54 knots at 3 km. Continuing to move in the same direction, the deep depression intensified into a cyclonic storm by 1730 IST on the 6th, when its centre was near 13.0°N, 93.5°E. The following observations of 6th are of interest:

Name of the Ship/Stn.	Position	Hour of Obsn. IST	Wind		Remarks
			Dirn.	Speed Knots	
Coco Island		1730	NNE	15	Slight continuous rain
Port Blair		1730	WNW	25	Slight continuous rain
EEIM	13.9°N,93.7°E	1730	NE	35	-

Estimated pressure at the centre of the storm was 990 mb, and the press deficiency was about 16 mb. The cyclonic storm became severe by next morning and was centred at 0830 IST of 7th near 14.0°N, 93.0°E.as indicated by the following observations of 7th.

Name of the Ship/Stn.	Position	Hour of Obsn. (IST)	Wind Dirn.	Wind Speed (Knots)	Remark
EETM	13.5°N, 92.5°E	0630	NW	45	
Cocos Island		0830	SE	40	Slight continuous drizzle
LENDANARA	15.2°N, 95.5°E	0530	ESE	35	Showers
Maya Bandar		0830	WSW	20	Moderate continuous rain

The estimated pressure at the centre of the severe cyclonic storm was 98 mb and the pressure defect was about 28 mb. Moving in a northnorthwesterly direction, the severe cyclonic storm was centred near 15.5°N, 92.5°E at 1730 IST of 7th The severe storm was centred near 17.5°N, 90.5°E at 0830 IST on the 8th. The following ships observations of 8th are significant in this connection:

Name of the Ship/Stn.	Position	Hour of Obsn. (IST)	Wind Dirn.	Wind Speed (Knots)	Remarks
S.S.Fansta	18.1°N, 89.3°E	0530	N	50	Reported squall, heavy rain with mountaneous swell
S.S.Fansta	17.6°N, 89.0°E	0915	N	50	
S.S.Landaura	17.2°N, 91.8°E	0630	S	50	
S.S.Fansta	17.7°N, 89.2°E	1155	N	50	
S.S.Landaura	17.0°N, 92.0°E	1140	S	45	

Moving northnorthwest, the severe cyclonic storm was centred at 1730 IST of 8th near 19.5°N, 90.0°E. Thereafter, moving north, the severe cyclonic storm crossed the East Pakistan coast on 9th morning, weakened into a cyclonic storm and lay centred near 22.5°N, 90.0°E at 0830 IST. Subsequently, it moved northeastward rapidly weakened into a depression and lay over the Khasi-Jaintia hills and adjoining areas at 1730 IST of 9th. The depression moved northeastwards and weakening further, it broke up over the Assam-Himalayas by the morning of 10th.

In association with this disturbance, the north Bay Islands experienced a spell of very heavy rain from 4th to 7th. The noteworthy amounts of rainfall recorded were:

Date	Station	Rainfall (cm)
4th	Port Blair	9
5th	Maya Bandar	12
	Long Island	9
6th	Maya Bandar	12
	Long Island	15
7th	Port Blair	12
	Long Island	15

During the last dissipating stage of the storm, a spell of heavy rain occurred in Assam. The chief amounts of rainfall recorded were:

Date	Station	Rainfall (cm)
10th	Haflong	16
	Chaparmukh	14
	Shillong	13
	Cherrapunji	11

According to the press reports, the severe storm caused extensive damag to life and property in East Pakistan. The deathroll mounted to about 138 in Eas Pakistan. Almost all the kutcha houses in Dacca City were destroyed and the city was flooded with water two feet deep. Damage to houses and some loss of life wer also reported in Tripura State.

4 Severe cyclonic storm in the Arabian Sea—
—23rd to 25th May—

Under the influence of an upper air cyclonic circulation extending to about 6.0 km and moving across extreme south Peninsula into the southeast Arabian Sea, a feeble trough of low pressure developed off the Malabar coast on 16th May. It moved north slowly and became more marked by the morning of 19th, when it lay over east Arabian Sea off north Kanara-south Konkan coasts. Persisting over the same area during the next two days, it was seen as a well marked trough of low pr sure on the morning of 22nd when pressure departures were 4 to 5 mb below normal over north Kanara-south Konkan coasts. Under the influence of the disturbance, t southwest monsoon advanced along the west coast upto 16°N. At 1730 IST of 22nd, the upper level cyclonic circulation extended over north Mysore upto 6 km. Thereafter, the system intensified rapidly and concentrated into a depression which wa centred at 0830 IST of 23rd near 14.0°N, 73.0°E. The associated cyclonic circulation extended to 7 km. It became a deep depression by 1130 IST on the same day. Significant in this connection is the observation of the ship 'Maithaimaru' (whic was located at 13.5°N, 73.0°E) at 1130 IST. The ship reported a surface wind of 270/35 knots, sea level pressure 1000.5 mb and heavy continuous rain. The estima central pressure of the depression was 999 mb. Storm-type microseisms also were ported from the Colaba Observatory Seismographs from 1130 IST onwards. These microseisms strengthened gradually later. The deep depression further intensified into a cyclonic storm by 1730 IST of 23rd when it was centred near 14.5°N, 73.0°E. Upper winds of Gadag and Vengurla strengthened to 30-40 knots between 2 to 3 km. S.S.Maithaimaru (14.3°N, 72.3°E), which was then about 20 miles from the storm centre, reported surface wind 320/45 knots pressure 996 mb and heavy continuous rain. At 2330 IST of 23rd, the same ship located near 14.5°N, 71.5°E reported 320/40 k and moderate continuous rain.

The cyclonic storm moved northnortheastwards and intensifying further b came a severe cyclonic storm of small extent by 0830 IST of 24th when it lay centred about 50 km southsouthwest of Vengurla. In this connection, the following observations of S.S.Jalamanjari of 24th are interesting:

Position	Time	Direction	Speed (Knots)	PPP (mb)	Remarks
15° 39'N 73° 19'N	0700	NE	8/10 BF	994.4	Overcast, continuous heavy rain
	0800	NE	10/12 BF	989.1	Overcast, rough sea, and rough and heavy swell

Position	Time	Direction	Speed Knots		PPP (mb)	Remarks
	0900	NNE	12/	BF	988.0	Overcast, continuous heavy rain
	1000	N/NNE	10	BF	983.7	Heavy rain
	1100	N	8/10	BF	985.0	Heavy rain, rough sea
	1200	Variable	10	BF		Heavy rain
	1400	WNW	10	BF	997.7	Overcast, rough heavy swell
	1500	WNW	8	BF	998.2	Overcast, rough heavy swell

The following 3 hourly observations of Vengurla recorded on 24th show tl rapid wind changes which occurred over that station during the northeast passage (the severe cyclonic storm.

Time IST.	Wind Dirn.	Wind Speed (Knots)
0830	NE	24
1130	S	52
1430	SW	25
1730	WSW	22

The following extracts from the weather diary of 24-5-1961 maintained by the Pilot Balloon Observatory at Vengurla will also be of interest:

> "Sky continued to be thickly overcast with As. and Sc. and later with Ns and St. Fairly strong northeasterly wind started from early morning accompanied by moderate continuous rain. Surface wind speed steadily increased to 25 kt by 0830 IST. Between 0830 to 1100 IST, wind direction veered to S, speed continuously increasing all the time. From 1100 to 1230 IST, wind direction remained southerly, speed reaching 50 to 55 knots whole gale condition uprooting many big trees and blowing away zinc sheets from buildings; large scale damage occurred. Speed graduall decreased coming down to 25knots in the afternoon, direction also changing first to SW and later on to W."

The severe cyclonic storm was centred close to the south Konkan coast ne 16°N at 1130 IST of 24th as indicated by the 1100 and 1200 IST observation of Jala manjari and 1130 IST surface wind at Vengurla, vide Table above. It crossed the south Konkan coast near Devgad by the afternoon of the same day and lay over south Maharashtra as a severe cyclonic storm with its centre close to Devgad at 1730 IST of 24th, when Devgad reported a northwesterly wind of 49 knots and a sea level pressure of 994.8 mb. The severe cyclonic storm weakened rapidly and was lying as a deep depression over south Madhya Maharashtra and adjoining Mysore State by 0830 I of 25th, with its centre between Bijapur and Sholapur. Weakening and moving eastwards, it lay as a depression over Telangana at 1730 IST of the same day centred between Bidar and Hyderabad. It weakened further into a low pressure area over coastal Andhra Pradesh by the morning of the 26th.

In association with the formation of the storm, the southwest monsoon advanced to extreme south Kerala on the 18th and extended rapidly northwards upto 16 by the 22nd. The cyclonic storm caused very heavy rain accompanied by strong wind at a number of places in south Konkan and south Madhya Maharashtra. According to

press reports, the coastal belt was the hardest hit, several houses were extensively damaged, and tens of thousands of coconut and mango trees were uprooted in Ratnagiri district. Dislocation of telegraphic and telephonic communications was reported at several places. Three boats were sunk in sea near Karwar. Four country crafts and two launches were sunk in Malvan port. It was reported that Vengu Malwan, Kudal and Sawantawadi were the worst affected areas. Due to very heavy rains, Kali river (near Yellapur) rose in floods and destroyed a 30 feet high bri

5 Severe cyclonic storm in the Bay of Bengal——
——27th to 30th May——

A trough of low pressure moved across Tennasserim into the north Andama Sea on the morning of 25th May. The pressure fell by about 3 mb, and pressure departures were about 4 mb below normal over the north Andaman Sea and adjoining ar of Burma. Upper winds over Port Blair at lower tropospheric levels veered from w to north and a well marked trough line lay over north Andaman Sea upto 0.9 km. L Island and Port Blair recorded respectively 12 cm and 13 cm of rainfall on the 25 On 26th morning, heavy rain occurred in the Bay Islands and Tennasserim; Tavoy reported 16 cm while Victoria Point, Cocos Island and Port Blair recorded 10 cm. By the evening of 25th, the negative pressure departures became 5 to 6 mb and the up air cyclonic circulation extended upto 4.5 km. Upper winds over Port Blair becam westerly 40 to 45 knots between 1.5 to 3.6 km. By 27th morning, the well marked trough of low pressure concentrated into a depression centred at 0830 IST near 15.0°N, 95.0°E. Tavoy reported 13 cm and Port Blair 18 cm of rain. The estimate pressure defect at the centre was about 9 mb. Moving northwest, the depression l over the north Andaman Sea and adjoining east central Bay of Bengal with centre ne 16.0°N, 94.0°E at 1730 IST of 27th. It continued to move northwestwards and inte sified int a cyclonic storm by 0830 IST of 28th, when it was centred within half- degree of 18.0°N, 92.0°E. Ships' observations were practically absent in the fie of the cyclonic storm. Moving slowly northwestwards, the cyclonic storm was cent near 18.5°N, 91.5°E at 1730 IST on 28th May and near 19.5°N, 91.0°E at 0830 IST o 29th. In this connection, the following observations of 29th are of interest:

Name of the Ship/Stn.	Position	Hour of Obsn. (IST)	Wind Dirn.	Wind Speed (Knots)	Remarks
S.S.Molenkerk	16.3°N,89.2°E	0630	W	40	Showers
S.S.Canpbys	15.6°N,92.2°E	0230	SSW	10	
Mustali	20.5°N,89.6°E	0530	E	20	Continuous rain
Akyab		0830	SE	5	Slight rain

Thereafter, the cyclonic storm moved north and lay at 1730 IST of 29th over northeast Bay of Bengal with centre near 20.0°N, 91.0°E. The following ship observations of 29th are significant:

Name of the Ship/Stn.	Position		Hour of Obsn. (IST)	Wind Dirn.	Wind Speed (Knots)	Remarks
Clan Maclachalan	21.0°N,	91.2°E	1530	E	13	Heavy southerly swell Rain showers.
Clan Maclachalan	20.8°N,	91.6°E	1330	SSE	35	Moderate to heavy southerly swell
Molenkerk	17.3°N,	90.2°E	1730	W	30	Occasional rain showers
Mustalvan	21.7°N,	88.0°E	1930	NNW	20	Squall

On the night of 29th, it intensified into a severe cyclonic storm which had a core of hurricane winds as indicated by 1930 IST observations of S.S.Clan Maclachalan (20° 42'N, 91° 25'E) which reported wind ESE, 60 knots and high swell Recurving northnortheastwards, the severe cyclonic storm was centred at 0830 IST 30th close to Chittagong coast near 22.5°N, 91.5°E. It crossed coast near Chitta gong by about noon, waakened and lay as a deep depression over lower Assam with c tre at 1730 IST of 30th near Aijal. It then broke up rapidly against the hills. The lowest estimated central pressure during the life history of the storm was 98 mb at 0830 IST of 30th and the corresponding pressure deficiency was 25 mb. In a sociation with the formation and movement of the disturbance, the Bay branch of t monsoon gradually strengthened and temporarily advanced into Assam on 31st May. S of the noteworthy amounts of rainfall recorded were:

Date	Station	Rainfall (cm)	Date	Station	Rainfall (cm)
25th	Port Blair	13	31st	Cherrapunji	22
	Long Island	12		Agartala	15
27th	Port Blair	18		Mymensing	10
28th	Maya Bandar	12		Narayanganj	10

According to press reports, gales of the order of one hundred miles per hour and a tidal bore was experienced,in some of the coastal districts of East Pakistan.

6 Depression in the Bay of Bengal—
—8th to 13th June—

A low pressure area from the east moved into northeast Bay of Bengal on the morning of 6th June with associated upper air cyclonic circulation between 1.! km and 3.6 km above sea level. By the 7th morning, the low pressure area lay ove the north Bay and the adjoining coastal areas. Pressures fell rapidly over Chitt gong-Arakan coasts, where widespread rainfall with scattered heavy falls occurred and pressure departures were 6 to 7 mb below normal. On the evening of 7th, the upper air cyclonic circulation associated with the low pressure area over north B and adjoining areas extended to 5.4 km, and the pressure deficiency became 6 to 8 mb. By the morning of 8th, the low pressure area concentrated into a depression centred at 0830 IST near 21.0°N, 90.0°E. The associated cyclonic circulation extended to 6 km. The following 0830 IST observations of 8th, are relevant in this connection:

Station	Wind		Pressure (mb)	Remarks
	Dirn.	Speed (Knots)		
Calcutta (Alp)	NE	05	994.5	
Saugor Island	NNW	05	994.0	
The Sandheads	NW	15	994.0	
Cox's Bazaar	SE	05	996.0	Slight continuous rain
Chittagong	SE	10	996.9	Moderate intermittent drizzle

Upper winds over Akyab at 0530 IST of 8th were southerly 20 to 30 knots between 0.3 and 0.9 km.

The depression moved northwestwards and lay with its centre at 0130 IST of 9th close to Sunderbans coast near 21.5°N, 89.0°E. It continued to move northwestwards and crossed Sunderbans coast early in the morning of 9th and was centred at 0830 IST of the same day about 30 km southsouthwest of Calcutta.

The depression then moved practically westwards and lay over Bihar Plateau with its centre at 0830 IST of 10th about 70 km west of Chaibasa. Then it moved northwestwards and was centred at 0830 IST of 11th about 50 km southwest of Daltonganj. Thereafter, the depression recurved and moved northeastwards and was centred about 70 km to the northeast of Daltonganj at 0830 IST of 12th. Continuing its northeastward movement, the depression began to weaken gradually and was centred about 30 km to the northeast of Gaya at 0830 IST of 13th. Thereafter, it moved eastnortheastwards and weakening further, it lay as a well marked low pressure area over the Bihar Plains and adjoining areas of Sub-Himalayan West Bengal. By the evening of the same day, it weakened into a low pressure area and lay over Sub-Himalayan West Bengal and its neighbourhood. It filled up thereafter.

During the life time of the depression, the estimated lowest pressure at the centre was 998 mb and the corresponding pressure deficiency was 9 mb at 1730 IST of 8th June 1961.

Under the influence of the depression, strong to vigorous monsoon conditions prevailed over parts of northeast India from 8th to 14th and over east Madhya Pradesh between 10th and 13th. Heavy to very heavy rain was reported from a number of places in east Madhya Pradesh on 11th and 12th. A few noteworthy amounts of rainfall were:

Date	Station	Rainfall (cm)	Date	Station	Rainfall (cm)
11th	Raigarh	19	13th	Darjeeling	17
	Cherrapunji	25		Cherrapunji	40
12th	Champa	13	14th	Cherrapunji	30
	Cherrapunji	39			

7 Severe cyclonic storm in the Arabian Sea——
——21st to 26th June——

An upper air cyclonic circulation in the lower and middle troposphere moved from the east into north and adjoining central Bay on the morning of 18th. Moving further westwards, it was lying over the east central Arabian Sea off Konkan coast by 2330 IST of 20th. Under its influence, a low pressure area formed over east Central Arabian Sea off Konkan coast on the morning of 21st. The low pressure area moved northwards and concentrated into a depression by 0830 IST of 21st, with its centre near 19.0°N, 71.0°E. It moved in a northwesterly direction and was centred near 20.0°N, 69.0°E at 0830 IST of 22nd. By the same evening, it intensified into a deep depression and was centred at 1730 IST near 20.5°N, 68.5°E. In this connection, the following observations of 22nd are of interest:

Name of the Ship/Stn.	Position	Hour of Obsn. (IST)	Wind Dirn.	Wind Speed (Knots)
Jagrani	20.3°N,71.0°E	1730	S	25
Veraval		1730	SSE	25
Porbandar		1730	ESE	15
Diu		1730	SSE	20

There was also marked strengthening of upper winds over Saurashtra-Kutch between 0.6 and 0.9 km.

The deep depression moved northnorthwestwards and intensified into a cyclonic storm by 0830 IST of 23rd when it lay over north Arabian Sea with centre nea

21.5°N, 68.0°E. Upper winds over Jamnagar at 0530 IST of 23rd, strengthened to S/35 knots between 0.6 and 0.9 km. Moving further northwards, the cyclonic storm was centred near 23.0°N, 68.0°E.at 1730 IST of the same day. In this connection, the following observations of 23rd are of interest:

Station	Time of Obsn. (IST)	Wind Dirn. (Deg.)	Wind Speed (Knots)
Naliya	1130	160	30
Dwarka	1130	180	20
Naliya	1730	200	35
Dwarka	1730	190	45

Thereafter, it intensified further into a severe cyclonic storm of smal extent and recurving northeastwards, lay by about midnight of 23rd, close to coas near Naliya (Kutch). At 2330 IST of 23rd, Naliya reported surface wind 250/45 kt Dwarka reported surface winds WSW/50-55 knots between 0130 to 0530 IST of 24th. T severe cyclonic storm crossed Kutch coast, weakened and lay as a cyclonic storm c ose to Naliya during the early hours of 24th and at 0830 IST of that day, it was centred about 60 km northnorthwest of Bhuj. Weakening further and moving northea wards, it lay as a depression over southwest Rajasthan and neighbourhood on the e ening of 24th with its centre at 1730 IST about 70 km southwest of Barmer. Then, it moved eastnortheastwards and was centred about 100 km southwest of Jodhpur at 0 IST of 25th. It lay over Rajasthan with its centre about 20 km to the northnorthe of Jodhpur at 0830 IST of 26th. Thereafter, it weakened further and merged with seasonal trough of low pressure.

In association with the formation and movement of this storm, there was general revival of the southwest monsoon over the country from 18th June. The mo soon was active in Madhya Maharashtra on 20th, 21st and over the Konkan on 23rd a 25th. Fairly widespread rain with scattered heavy falls occurred in Gujarat Stat and the adjoining areas of Rajasthan from 23rd to 26th. Some of the noteworthy amounts of rainfall recorded were:

Date	Station	Rainfall (cm)
21st	Bombay	8
24th	Dwarka	8
26th	Baroda	8
	Barmer	10

8 Depression in the Bay of Bengal—
—27th to 28th June—

An upper air cyclonic circulation in lower tropospheric levels moved ac- ross Tennasserim into north Andaman Sea on the morning of 21st where a well marke trough of low pressure developed by the morning of 22nd. The trough of low press shifted northwestwards and slowly developed into a low pressure area by the eveni of 25th June when it lay over east central Bay of Bengal. On the evening of 26th the low pressure area was lying over east central Bay and adjoining north Bay and was well marked and the associated cyclonic circulation extended to 7.2 km. By t morning of 27th, it concentrated into a depression which was centred at 0830 IST within half-a-degree of 17.5°N, 92.5°E. In this connection, the following observa tions of 27th are relevant:

Name of the Ship/Stn.	Position	Hour of Obsn. (IST)	Wind Dirn.	Wind Speed (Knots)	Remarks
S.S.Mustansir	19.4°N, 90.4°E	0530	NNE	05	Rain or shower in last hour
S.S.Salween	14.6°N, 94.1°E	0530	SW	25	Moderate intermittent drizzle
Akyab		0830	E	05	
Sandoway		0830	-	-	Rain in last hour
Bassein		0830	S	05	
Coco Island		0830	WSW	20	

Upper level cyclonic circulation associated with the depression extended upto 7.2 km. The estimated pressure defect at the centre of the depression was about 12 mb. Moving northwest, it was centred at 1730 IST of the same day within half a-degree of 18.5°N, 91.5°E and at 0830 IST of 28th near 20.0°N, 90.5°E. Thereafter it weakened into a low pressure area which lay over Gangetic West Bengal on the evening of 28th. Moving into Bihar Plateau, the low pressure area merged with the seasonal trough of low pressure by the morning of 1st July.. Noteworthy amounts of rainfall associated with the depression were:

Date	Station	Rainfall (cm)
27th	Car Nicobar	8
28th	Saugor Islands	8
30th	Jamshedpur	10

9 Depression in the Bay of Bengal——
——1st and 2nd July——

On the evening of 30th June 1961, an upper level cyclonic circulation developed over the north Bay of Bengal between 3 and 6 km. and a trough was seen at lower levels. By the morning of 1st July, a low pressure area formed over the north west Bay and the adjoining land areas. The associated upper air cyclonic circulation extended upto 7 km and the pressure departures over the area were 6 to 7 mb below normal. The low pressure area concentrated into a depression, which was centred at 1730 IST of 1st near 21.0°N, 88.0°E. At 0830 IST of 2nd July, it lay close to north Orissa-West Bengal coats with its centre near 21.0°N, 87.5°E. The estimated pressure defect at the centre of the depression was about 9 mb. It crossed north Orissa coast near Balasore and was centrec at 1730 IST about 100 km westnorthwest of Balasore. It then moved in a westnorthwesterly direction and weakened into a low pressure area which lay over northeast Madhya Pradesh on the morning of 3rd July. The low pressure area became unimportant by the 5th.

In association with the depression, fairly widespread rain occurred in Gangetic West Bengal, Orissa and Bihar Plateau in the beginning of July, the main rainfall amounts were as follows:

Date	Station	Rainfall (cm)
2nd	Cuttack	11
	Titlagarh	8

10 Land depression over Saurashtra-Kutch——
——2nd to 5th July——

A well marked trough in lower tropospheric levels developed over the so thern parts of West Pakistan and adjoining areas of northeast Arabian Sea, Sauras tra and Kutch by the morning of 29th June. Under its influence, a trough of low pressure extending from lower Sind to north Konkan formed by the morning of 1st J 1961. Pressures fell by 3 to 4 mb over north Konkan and south Saurashtra, where the departures were 8 to 9 mb below normal. On the same evening, a well marked l pressure area developed over Saurashtra and Kutch. The associated cyclonic circu lation extended upto 4.5 km. By the morning of 2nd July, the well marked low pre sure area concentrated into a land depression which lay over Saurashtra and was c tred at 0830 IST near Veraval. The depression emerged into the Gulf of Cambay by the midnight of 2nd and was centred at 0830 IST of 3rd about 60 km westsouthwest Surat. It recurved northwest and lay over east Saurashtra by the early morning o 4th. It was centred about 50 km northwest of Bhavnagar at 0830 IST of 5th. Ther after, the depression rapidly weakened into a trough of low pressure which became unimportant by the next day.

In association with the depression, the southwest monsoon was vigorous north Konkan on 2nd and 3rd and over Saurashtra and Kutch on 4th and 5th. Some n teworthy amounts of rainfall recorded were:

Date	Station	Rainfall (cm)	Date	Station	Rainfall (cm)
2nd	Bombay (Colaba)	14	4th	Junagadh	35
	Veraval	8		Porbandar	10
	Junagadh	33		Jamnagar	6
3rd	Dahanu	22		Bhuj	6

11 Land depression over lower Sind and Kutch——19th July——

A low pressure area developed over West Bengal and the adjoining areas East Pakistan on the morning of 15th. It moved progressively westnorthwestwards across the country. On the evening of 18th July, it lay as a low pressure area o southwest Rajasthan. It moved southwestwards and concentrated into a depression by the morning of 19th, with its centre at 0830 IST about 100 km west of Badin. I this connection the following upper wind observations of 19th are of interest:

Time	Height (km)	Bhuj	Karachi
0530	0.6	190/42 knots	360/35 knots
IST	0.9	190/39 knots	030/36 knots
	1.5	—	040/38 knots
	3.0	—	040/39 knots
	4.5	—	050/51 knots

The pressure defect near the centre of the depression was about 5 mb. remained practically stationary and weakened into a low pressure area by the even ing of 19th. The low pressure area merged into the seasonal low over West Pakista by the evening of 20th July.

In association with the formation of the land depression, widespread ra fall occurred in Gujarat State on the 19th. The principal amounts of heavy rain on the 19th were:

Date	Station	Rainfall (cm)
19th	Porbandar	10.4
	Naliya	10.1
	Jodiya	8.9

12 Depression in the Arabian Sea—
—27th & 28th August—

A low pressure area formed over the north Bay of Bengal on the morning of 22nd August. Associated upper air cyclonic circulation extended upto 5.4 km. It moved westnorthwestwards and lay as a well marked low pressure area over south Rajasthan and neighbourhood on the morning of 26th. Associated upper air cyclonic circulation was well marked and extended upto 9 km. Pressure departures near the centre of the low were 6 to 7 mb below normal. Then the low pressure area moved westsouthwest and lay over lower Sind, Kutch and adjoining areas of northeast Arabian Sea on the morning of 27th. By the evening of the same day, it intensified into a depression and lay centred at 1730 IST near 22.5°N, 68.5°E as indicated by the following observations of 27th.

Station	Time of Obsn (IST.)	Wind	Pressure (mb)
Dwarka	1730	WSW/30 knots	996.3
Naliya	1730	ESE/20 knots	995.4

The estimated pressure defect at the centre of the depression was about 8-9 mb.

Thereafter, it moved northwestwards and lay over the northeast Arabian Sea at 0830 IST of 28th with centre near 23.5°N, 67.5°E (about 150 km westnorthwest of Naliya). It weakened into a low pressure area by the same evening and lay off the Mekran coast. The low pressure area merged with the seasonal low over West Pakistan on the 29th.

In association with the formation and movement of the depression active to vigorous monsoon conditions prevailed in Gujarat State on 26th and 27th when very heavy rainfall was reported from a few stations. Some noteworthy amounts of rainfall recorded were:

Date	Station	Rainfall (cm)
26th	Broach	22
	Veraval	18
	Porbandar	13

Date	Station	Rainfall (cm)
27th	Dwarka	20
	Bhuj	8
	Naliya	7

13 Deep depresssion in the Bay of Bengal and the Arabian Sea—6th to 16th September—

A mid-tropospheric cyclonic circulation extending upto 4.5 km developed over the Head Bay of Bengal on the evening of 4th September. By the next morning a low pressure area formed over coastal West Bengal and the adjoining North Bay. The low pressure area became well marked by the same evening and lay over northwest Bay and the adjoining land areas. Associated upper air cyclonic circulation exten

ded upto 9 km. The low pressure area concentrated into a depression, centred at 0130 IST of 6th close to the Sundarbans coast near 21.5°N, 88.5°E. At 0130 IST of 6th Sandheads reported surface wind W/25 knots and sea level pressure 997.9 mb. Saugor Island reported NNE/15 knots and a surface pressure of 996.4 mb. The depression became deep by 0830 IST of 6th when it was centred about 40 km northnorthwest of Contai. The pressure deficiency near the centre was about 7 mb. It remained practically stationary during the next 12 hours. Thereafter moving in a westnorthwesterly direction it lay at 0830 IST of 7th about 50 km south of Jamshedpur. Moving in a westerly direction it was centred at 1730 IST of the same day about 50 km northwest of Jharsuguda. At 0830 IST of 8th it lay over Madhya Pradesh with centre about 70 km northwest of Pendra. Continuing to move westnorthwestwards it lay over west Madhya Pradesh on the morning of 9th with its centre at 0830 IST about 20 km northeast of Bhopal and at 1730 IST it was close to Jhalwar. Then it moved northwestwards and was centred about 20 km north of Kotah at 0830 IST of 10th and about 40 km to the east of Ajmer at 0830 IST of 11th. At this time, the lowest pressure near the centre of the deep depression was 992 mb and the pressure deficiency was 13 mb. At 1730 IST of the same day it was centred about 70 km northwest of Ajmer. Thereafter, the deep depression moved westsouthwestwards and at 0830 IST of 12th September it lay over southwest Rajasthan with centre between Jodhpur and Barmer. By 0830 IST of 13th it lay about 60 km east of Chhor in West Pakistan. Moving southwestwards, it emerged into the northeast Arabian Sea by the morning of 14th with centre at 0830 IST about 200 km northwest of Dwarka. It continued to move southwestwards and was centred near 22°N, 65°E at 0830 IST of 15th and near 21°N, 63°E at 0830 IST of 16th as indicated by the following ships observations of 16th.

Name of the ship	Position	Hour of Obsn.(IST)	Wind	
			Dirn.	Speed (Knots)
S.S.Macilina	21.6°N,62.2°E	0530	ENE	30
S.S.Caltex Edinburg	20.5°N,63.2°E	0530	W	25

Thereafter it moved rapidly westwards, crossed the Saudi Arabian coast and weakened into a low pressure area by the evening of 16th.

The deep depression caused widespread and very heavy rain to the south of its track. Some of the noteworthy amounts of rainfall reported were:

Date	Station	Rainfall (cm)	Date	Station	Rainfall (cm)
7th	Cuttack	21	10th	Ratlam	13
	Balasore	18		Hoshangabad	12
	Angul	12		Bhopal	11
8th	Raigarh	12	12th	Deesa	18
	Champa	10	13th	Deesa	21
9th	Pachmarhi	38		Mount Abu	33
	Jaisalmer	32	14th	Kutch Mandvi	11
	Betul	24			
	Hoshangabad	17			
	Chhindwara	14			

According to newspaper reports, the very heavy rain caused large scale and severe floods over many parts of the country and in particular over Orissa and Vidarbha. The rivers Mahanandi and Brahmani rose in spate and 16 villages in Orissa were reported to have been washed away. Crops in severeal hundred acres on the banks of Wainganga, the Wardha and the Purna rivers were damaged and hundreds of houses collapsed as a result of floods in Vidarbha.

14 Cyclonic storm in the Bay—
—11th to 17th September—

An upper air cyclonic circulation extending between 1.5 and 3 km lay ov central Burma on the morning of 8th. It gradually deepened and moved slowly west wards. Under its influence, a low pressure area formed over the northeast and ad joining east central Bay of Bengal on the morning of 10th. Pressures were fallin rapidly along the Arakan coast. On the morning of 11th negative pressure departu of the order of 8-10 mb over the Arakan coast and the upper air cyclonic circulat extending upto 7 km over the east central Bay and neighbourhood suggested that th low pressure area over northeast Bay and neighbourhood had concentrated into a de ression centred at 0830 IST of 11th close to the Arakan coast with centre near 19 93.0°E. It deepened and was centred at 1730 IST of 11th near 19.5°N, 93.0°E. Th following observations of 11th are significant in tbis connection:

Name of the Ship/Stn.	Position	Hour of Obsn. (IST)	Wind		Weather
			Dirn.	Speed (Knots)	
S.S.Burma Star	18.4°N,92.43°E	1800	WSW	35	Rain squalls rou seas heavy swell
S.S.Empire Merchant	16.0°N,92.3°E	1530	WSW	35	Squall
Akyab		1730	E	10	Slight intermitt ent drizzle

The upper air cyclonic circulation associated with the deep depression tended to 9 km. Moving northwest it intensified rapidly into a cyclonic storm on the morning of 12th, when it lay over northeast Bay and was centred at 0830 IST ne 20.5°N, 91.5°E. In this connection the following observations of 12th are relevar

Name of the Ship/Stn.	Position	Hour of Obsn. (IST)	Wind		Weather
			Dirn.	Speed (Knots)	
S.S.Chepo	20.0°N,91.0°E	0730	W	30	Heavy rain
S.S.State of Orissa	20.0°N,89.7°E	0530	W	10	Rough seas, drizzle
S.S.Ranee	21.0°N,91.3°E	0930	E	40	Rain showers
S.S.Noveverett	20.9°N,91.5°E	1430	SE	20	Overcast
Akyab		0130	S	25	Rain
Cox's Bazar		0830	E	10	Slight continuous rain
Sandheads		0830	W	15	Drizzle

The estimated central pressure of the storm was 987 mb and the pressure defect was about 18-19 mb.

The cyclonic storm moved westnorthwest and was centred at 0830 IST of 13 close to Sunderbans coast west of Saugor Islands and was crossing coast near Conta The following observations of 13th are relevant in this connection:

Name of the Ship/Stn.	Position	Hour of Obsn. (IST)	Pressure (mb)	Wind/Weather
S.S.Cheshire	20.6°N,88.2°E	0530	996.2	Overcast
Sandheads		0830	999.1	Moderate continuous drizzle
Saugor Island		0830	996.9	SSE/30 knots. Moderate continuous drizzle

The storm crossed the coast near Contai in the course of the day, weakened into a deep depression and lay at 1730 IST of 13th centred about 100 km south of Jamshedpur. The deep depression moved practically westwards and lay over east Madhya Pradesh centred at 0830 IST of 14th between Raigarh and Champa and over central parts of Madhya Pradesh and on the morning of 15th with centre at 0830 IST about 100 km south of Jabalpur. It weakened into a depression and was centred at 0830 IST of 16th near Narsinghpur. Thereafter, under the influence of a trough in westerlies over northwest India at 4.5 km and aloft it recurved and moved northeastwards and lay over southwest Uttar Pradesh on the morning of 17th with centre near Jhansi. It subsequently weakened rapidly and became unimportant by 18th.

In association with the disturbance, active to vigorous monsoon conditions prevailed in north Orissa on 14th, in east Madhya Pradesh on 14th and 15th and in west Madhya Pradesh and Vidarbha on 15th and 16th. Some noteworthy amounts of rainfall were:

Date	Station	Rainfall (cm)	Date	Station	Rainfall (cm)
13th	Saugor Island	15	15th	Pachmarhi	32
14th	Raigarh	21		Gondia	12
	Sambalpur	14	16th	Betul	27
				Khandwa	14

As a result of heavy rains, the rivers in Vidarbha and Madhya Pradesh and the river Narmada, in particular, burst their banks and caused devastating floods. Heavy damage to crops and serious dislocation of rail and road traffic in these parts have been reported in the press.

15 Depression in the Bay of Bengal—
—22nd to 23rd September—

An upper air cyclonic circulation between 1.5 km and 3.0 km a.s.l. developed over the head Bay of Bengal on the morning of 20th September and extended to lower levels by the same evening. The upper air cyclonic circulation slowly intensified and extended to 6 km a.s.l. by the evening of 21st. In association with the development, a depression formed over the Head Bay on the morning of 22nd with centre near 21°N, 89°E. Moderate to heavy rain was reported from the coastal station bordering the Head Bay and the negative pressure departure over these areas was of the order of 6 mb. It was centred near 21.5°N, 88°E at 1730 IST of 22nd. During late night of 22nd, the depression crossed Orissa coast between Contai and Balasor weakened and moved northwest. It lay at 0830 IST of 23rd as a low pressure area over north Orissa and neighbourhood. On the next morning, the low pressure area lay over north Madhya Pradesh and neighbourhood where it persisted without appreciable movement during the next two days. It weakened and merged with the seasonal trough of low pressure on the 27th.

In association with the formation and movement of the depression, the monsoon was active in Gangetic West Bengal on 22nd, in Bihar State on 23rd and in east Madhya Pradesh on 22nd and 23rd. Some noteworthy amounts of rainfall recorded were:

Date	Station	Rainfall (cm)
22nd	Dum Dum	9
	Alipore(Calcutta)	7
23rd	Dumka	10
	Sriniketan	8
	Sambalpur	8

16 Deep depression in the Bay of Bengal——
——27th September to 2nd October——

An upper air cyclonic circulation extending between 1.5 km to 3 km appeared over central Burma on the morning of 25th September. By the same evening it moved westwards into the north and adjoining central Bay and extended upto 6 km. Under its influence, a low pressure area formed over the northwest Bay on the morning of 26th. The upper air cyclonic circulation gradually extended to lower levels and by the next morning negative pressure departure of the order of 10 mb over coastal West Bengal and adjoining Orissa and scattered very heavy falls over the Orissa coast suggested that thelow pressure area over the northwest Bay concentrated into a depression. The depression was centred at 0830 IST of 27th near 20.5°N, 89.5°E. In this connection, the following observations of 27th are relevant:

Name of the Ship/Stn.	Position	Hour of Obsn. (IST)	Wind Dirn.	Wind Speed (Knots)	Weather
S.S.Clan Macleod	19.3°N,89.4°E	1130	W	25	Heavy intermittent rain
Cox's Bazar		0830	SSE	05	Rain in last hour
Sandheads		0830	N	05	-

The depression moved northnorthwest and was centred at 0830 IST of 28th near 22°N, 89°E. Associated cyclonic circulation extended uptp 9 km a.s.l. By the same evening it intensified into a deep depression when it was centred at 1730 IST near Saugor Islands (22°N, 88°E). The following observations of 28th are of interest in this connection:

Name of the Ship/Stn.	Hour of Obsn. (IST)	Pressure (mb)	Wind Dirn.	Wind Speed (Knots)	Weather
Saugor Island	1730	995.0	WSW	30	Moderate continuous rain
Sandheads	1730	997.0	WSW	20	Rain in previous hour
Calcutta	1730	996.3	SSE	05	Slight continuous rain
Kharagpur	1730	997.3	NE	03	Shower in previous hour
Contai	1730	995.3	NW	03	Heavy continuous rain

Calcutta reported ENE/40 knots at 0.6 km at 1730 IST on 28th September.

During the course of the night, the deep depression over the Head Bay moved west, crossed the coast near Contai, weakened into a depression and was centred at 0830 IST of 29th about 100 km southeast of Jamshedpur.

Moving westnorthwestwards, the depression lay over northeast Madhya Pradesh and adjoining Bihar Plateau and Orissa on the morning of 30th with centre at 0830 IST about 100 km eastsoutheast of Ambikapur. Then it recurved and by the nex morning it moved slightly northnortheastwards with centre at 0830 IST of 1st Octobe near Daltonganj. Thereafter, it moved eastnortheastwards and on the morning of 2n October pressure departures of the order of 12 mb over Bihar Plateau and the isobaric pattern indicated that the depression had intensified into a depression with centre at 0830 IST of 2nd about 120 km northeast of Hazaribagh. It was centred close to Sabour at 1730 IST of 2nd. Thereafter, the deep depression over Bihar Plateau and neighbourhood rapidly weakened into a low pressure area and lay on the morning of 3rd over Bihar Plains. The low pressure area became unimportant by the evening of 4th.

Very heavy rainfall occurred near the track of this depression, principal amounts being Saugor Islands 30 cm, Contai 21 cm and Balasore 20 cm on 29th September, Ambikapur 21 cm on 1st October and Sabour 19 cm and Kalimpong 13 cm on 2nd October. According to press reports, the heavy rains caused serious dislocation of railway traffic in Bihar State and West Bengal.

17 Land depression over the central parts of the country——9th to 13th October——

Under the influence of an upper air cyclonic circulation in the lower and middle troposphere which moved from the east into the central Bay on the evening of 3rd October, a low pressure area formed over the central Bay of Bengal on the morning of 4th October. The low pressure area became well marked by the next day and moving westwards it crossed the Circar's coast on 7th and lay over Vidarbha and the adjoining areas of Telangana on the morning of 8th. The associated upper air cyclonic circulation was well marked and extended to 7 km. Pressure departures were about 7 mb below normal over Vidarbha. The well marked low pressure area remained practically stationary and by the next morning concentrated into a depression with centre at 0830 IST of 9th near Yeotmal in Vidarbha. Remaining practically stationary over Vidarbha it was centred about 30 km southeast of Amravati at 0830 IST on 10th. By the next morning it intensified into a deep depression and was centred at 0830 IST about 40 km westnorthwest of Amravati. Then it moved northnorthwestwards and lay over west Madhya Pradesh on the morning of 12th with its centre at 0830 IST about 60 km west of Bhopal. Thereafter, it recurved, moved rapidly northeastwards and lay over Uttar Pradesh on the morning of 13th October with centre at 0830 IST close to Kanpur. At 0830 IST of 13th pressure fall over Kanpur during the preceding 24 hours was 6.4 mb and the departure was 10.1 mb below normal. The deep depression rapidly weakened in situ into a low pressure area by the evening of 13th and broke up over the Himalayas by the 15th.

Under the influence of the deep depression the monsoon strengthened over most of the country outside northwest India. In particular, scattered heavy to very heavy rains occurred in Maharashtra, Vidarbha, west Madhya Pradesh and Uttar Pradesh. Some noteworthy amounts of rainfall recorded were:

Date	Station	Rainfall (cm)	Date	Station	Rainfall (cm)
10th	Khandala	35	13th	Orai	22
	Parbhani	13		Auraiga(West Uttar Pradesh)	19
	Aurangabad	12		Mehgaon(West Madhya Pradesh)	15
	Bahraich	10		Lucknow	14
	Hardoi	10	14th	Ballia	14
11th	Buldhana	16		Kheri Lakhimpur	12
12th	Chikalda(Vidarbha)	14		Lucknow	11
				Bahraich	10

The heavy rains caused severe floods in the rivers of Uttar Pradesh, 57 persons were reported to have been killed in house collapses and floods. Part of Lucknow city were inundated by the waters of the river Gomati.

18 Depression in the Bay of Bengal—
—24th to 25th October—

A low pressure area from the east moved across the Arakans and deltaic Burma on the morning of 21st October over the northeast and the adjoining east central Bay off the Arakan coast on the morning of 22nd. The low pressure area became well marked by the morning of 23rd. By the morning of 24th it concentrated into a depression over the northeast Bay centred at 0830 IST near 21°N, 92°E. The depression moved northnorthwestwards and on the morning of 25th, lay over northeast Bay off Chittagong coast with centre at 0830 IST near 22°N, 91°E. It crossed East Pakistan coast near 90.5°E during the course of the day and by the evening it weakened into a low pressure area which lay at 1730 IST over the south ern districts of East Pakistan.

The following observations of Chittagong are of interest in this connection:

Date	Time of Obsn. (IST)	Pressure (mb)	Wind		Weather
			Dirn.	Speed (Knots)	
24	1730	1009.2	E	25	Rain
24	2330	1010.1	SE	25	Rain
25	0130	1009.8	SE	25	Rain
25	0530	1009.8	SE	20	Rain
25	0830	1012.2	SSE	20	Rain
25	1730	1009.1	WSW	15	Rain

The low pressure area moved northeastwards across south Assam and became unimportant by 28th October.

In association with the depression, a few heavy to very heavy falls of rain occurred over the Arakan-Chittagong coasts. Some noteworthy amounts of rainfall were:

Date	Station	Rainfall (cm)
23rd	Cox's Bazar	11
24th	Akyab	20
25th	Cox's Bazar	15
	Chittagong	12

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Table II

Monthly distribution of Cyclonic Storms and Depressions in the Bay of Bengal and Arabian Sea 1961

Month	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec		Total	
Disturbance	D	C	D	C	D	C	D	C	D	C	D	C	D	C	D	C	D	C	D	C	D	C	D	C	D	C
Bay of Bengal	1	-	1	-	-	-	-	-	-	2 (2)	2	-	1	-	-	-	3	1	1	-	-	-	-	-	9	3 (2)
Arabian Sea	1	-	-	-	-	-	-	-	-	1 (1)	-	1 (1)	-	-	1	-	1	-	-	-	-	-	-	-	3	2 (2)
Land depression	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	1	-	-	-	-	-	3	-
Total	2	-	1	-	-	-	-	-	-	3 (3)	2	1 (1)	3	-	1	-	4	1	2	-	-	-	-	-	15	5 (4)

D = Depression

C = Cyclonic Storm

Figures in brackets indicate severe cyclonic storms

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TRACKS OF STORMS AND DEPRESSIONS

(IN THE INDIAN SEAS)

1961